JULIE RESEARCH LABORATORIES, INC.
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#231

PRECISION VOLTAGE SUPPLIES

TYPES
PVS-105A, PVS-105A-1, PVS-105B
PVS-105B-1, PVS-110A-1

INSTRUCTION MANUAL

PVS82063

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THE PRECISION VOLTAGE SUPPLIES

. . . Types PVS-105A, PVS-105A-1, PVS-105B, PVS-105B-1, and PVS-110A-1 serve as an accurate standard voltage source. This instruction manual provides installation, operation, and maintenance instructions for all five models. The specifications and features of each type PVS are listed in table 1.

The Purpose

. . . of these supplies is to provide delivered voltage and current substantially higher than available from standard cells, and stability and absolute accuracy exceeding the performance of the laboratory-type saturated standard cell. Applications include use as a computer reference, a laboratory secondary standard voltage supply, and a potentiometric transducer supply. The supplies are recommended for wide-range calibration of many general purpose instruments and testing of ultra-precision components and instruments such as resistors, capacitors, gyros, transducers, meters, amplifiers, and power supplies.

Table 1. Performance Specifications

MODEL	PVS-105A	PVS-105A-1	PVS-105B	PVS-105B-1	PVS-110A-1
OUTPUT	Dual	Single	Dual	Single	Single
VOLTAGE (each section)	50V	50V	36V	36V	10V
VOLTAGE RANGE (each section)	120 mv	120 mv	120 mv	120 mv	12 mv
SCHEMATIC DIAGRAM	Figure 2	Figure 3	Figure 4	Figure 5	Figure 6
CURRENT	0-100 milliamperes				
INTERNAL IMPEDANCE	Less than 20 milliohms, 0-20 KC				
RIPPLE	1 millivolt, RMS				
RESPONSE TIME	Less than 100 microseconds				
ACCURACY 8 Hours Absolute	 0.002% 0.005%				
THERMAL STABILITY	Better than ± 2 ppm/°C in the region of 25°C.				
INPUT POWER OPERATING STANDBY (OPTIONAL)	 115V, 60 CPS, 1 PHASE, 1.5 AMPS 28V, 0.5 AMP, AC or DC				

Construction

. . . on a standard 19-inch wide by 14-inch high relay rack panel, provides the housing for all units. Stability is derived from a selected, aged, and stabilized Zener reference supply which is held at constant temperature in a thermostatically controlled oven. For highest stability, power input to this oven should be kept on permanently, even when operating power is off, by providing a separate 28V AC or DC supply. This will prevent recycling the aging characteristic of the Zener reference standard. Two separate reference elements are provided, in a common oven, for dual units.

Output voltage may be varied by means of a calibrated control. On dual units separate controls are supplied for each output. Dual supplies are connected in series and may be used end-to-end, with either end or the center tap grounded.

A voltmeter is provided on the front panel (two meters for dual supplies) just above the output voltage control. The meter permits coarse monitoring of output voltage and permits accurate adjustment of the bias for the Zener reference circuit, so that maximum stability can be obtained.

The Block Diagram

. . . is shown in figure 1. AC input power is rectified and pre-regulated by the Dressen-Barnes power supply. The pre-regulated output is fed through two separate series pass tubes (only one, in single supplies) and further regulated to provide the required accuracy and stability. This regulation is accomplished by dividing the final output in a Julie Research Laboratories precision divider network and comparing this output with the output of the oven controlled Zener reference standard. Any difference voltage appears as an error which is amplified and fed to the grid of the shunt regulator tube (or transistor base in model PVS-110A-1) to correct the output.

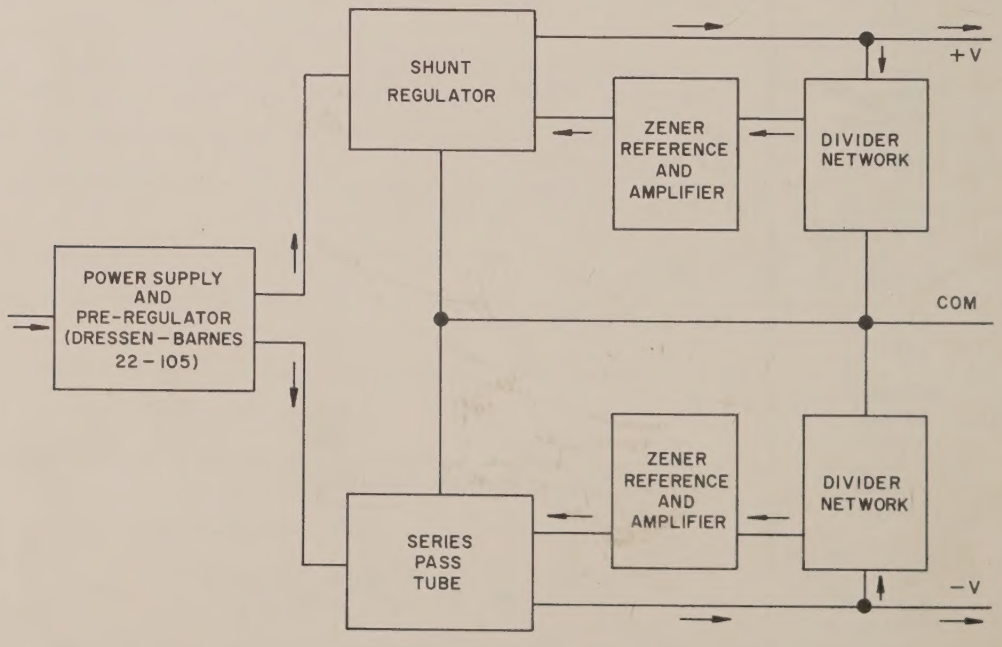


Figure 1. Block Diagram

INSTALLATION

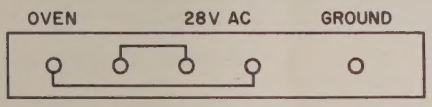
. . . of the PVS begins with uncrating and mounting the unit in a standard 19-inch rack or cabinet. Inspect the unit thoroughly for possible transit damage. Especially check the VR 105 voltage reference unit located at the right rear of the chassis to assure that it has not been damaged and that it is firmly mounted.

Electrical Connection

. . . depends on whether the oven is to be self powered or externally powered.

For Self Powered Oven Operation

. . . from the contained 28V AC power supply, connect the jumpers as shown:



For Externally Powered Oven Operation

. . . using an external 28V AC or 28V DC power supply to keep the oven energized, even when the remaining PVS circuits are turned off, remove the jumpers and connect the external supply to the two oven terminals on the left side of the terminal strip.

For External Ground Connection

. . . the chassis ground may be connected through the right hand terminal.

AC Power

. . . is connected through a shielded power cord and plug used for connection to a 105-125V AC outlet.

CAUTION

DO NOT TURN POWER ON UNLESS VOLTAGE REFERENCE UNIT VR 105 IS PLUGGED INTO SOCKET ON CHASSIS.

OPERATION

. . . is initiated by operating the power switch, a 2-amp circuit breaker located in the center of the front panel. Turn it on and allow two minutes before use and at least thirty minutes for rated stability.

NOTE

If oven is kept permanently energized, through use of an external 28 volt supply, the two minute warm-up will provide full stability.

Output Voltage Connections

. . . are made through front panel terminals, appropriately labelled for each model PVS. Either positive or negative terminals may be connected to chassis ground and/or external ground, or may be left "floating" above or below ground.

Dual supplies may be used independently, or may be used end-to-end; that is, 100, or 72 volts (depending on model) may be obtained between the left negative terminal and the right positive terminal. Either end, or center, may be grounded with this type of operation. Note that the two outputs of the dual supplies are internally series connected.

Output Voltage Variation

. . . is permitted by the calibrated output voltage control, which permits precise output voltage variation of up to 120 millivolts (12 millivolts on 10-volt model) from the nominal output voltage. On dual supplies separate controls permit completely independent variation. When dual supplies are connected in series the output variation range is 0 to 240 millivolts.

Reference Bias

. . . is factory set by a screwdriver adjustment. The reference bias supply adjustment may require resetting at very infrequent intervals. To check the need for this adjustment, press the push-to-adjust button while observing the panel meter. If any meter deflection is observed, unlock and adjust the reference potentiometer shaft to reduce meter deflection to zero when the push-to-adjust button is operated. Upon completion of the bias adjustment the internal feedback control circuit will be centered on the Zener reference standard for maximum accuracy and stability. Lock the control.

Monitoring the Absolute Output Voltage

. . . of single or dual supplies may be accomplished by using an accurate voltage standard, such as a JRL Voltage/Ratio/Resistance Reference Set VRS 105/6, or a JRL Primary Standard Absolute Voltage Reference SCO-106, in combination with a galvanometer connected to indicate any difference between the PVS and the voltage standard.

Dual Supply Balanced Output

. . . is possible through special monitoring terminals. Dual supplies may be operated with balanced voltages (within 1 or 2 millivolts) by monitoring the output difference voltage with a sensitive galvanometer. Connect the galvanometer between the terminals marked BALANCE and COMMON. Connect a jumper between the COMMON and GROUND terminals. Adjust either output control to make the galvanometer read zero. The output control calibrations will track each other to within 0.002 percent of the full scale supply voltage.

Monitoring Dual Supply Stability

. . . using the procedure described in the previous paragraph permits simultaneous monitoring of the stability of both supplies in dual units. Since each supply has a completely independent voltage reference element, amplifier, and regulator circuit, output variations in either supply are, therefore, completely independent and may be readily detected by either occasional or continuous monitoring with the balanced circuit arrangement.

MAINTENANCE

. . . is simplified because of the modular construction of the PVS supplies. This permits easy replacement of the VR 105 Voltage Reference Unit or the Dressen-Barnes power supply. Conventional maintenance procedures may be applied to the control and meter circuits. All tubes used in the PVS should be checked periodically and replaced as required. For all other maintenance or repair, the equipment should be returned to Julie Research Laboratories.

Trouble Shooting

. . . will be guided by the schematic diagrams, figures 2 through 6, and the following general outline:

a. NO OUTPUT VOLTAGE

(1) Check AC supply source and PVS connections.

(2) Use a multimeter to check output of Dressen-Barnes supply for 150-volt output between B+ and B- terminals. If there is little or no output, check tubes and components. Make tube replacements with standard tubes.

(3) Check the regulator tube or transistors (6AS7, 6336, TI495, 2N250; depending on model).

(4) If malfunction persists, remove VR 105 assembly and return it to JRL.

b. POOR REGULATION

(1) Check AC supply to assure that it is between 105 and 125 volts.

(2) Check 28 volt heater supply and connections.

(3) Check tubes and (in models where used) transistors.

(4) If malfunction persists, remove VR 105 assembly and return it to JRL.

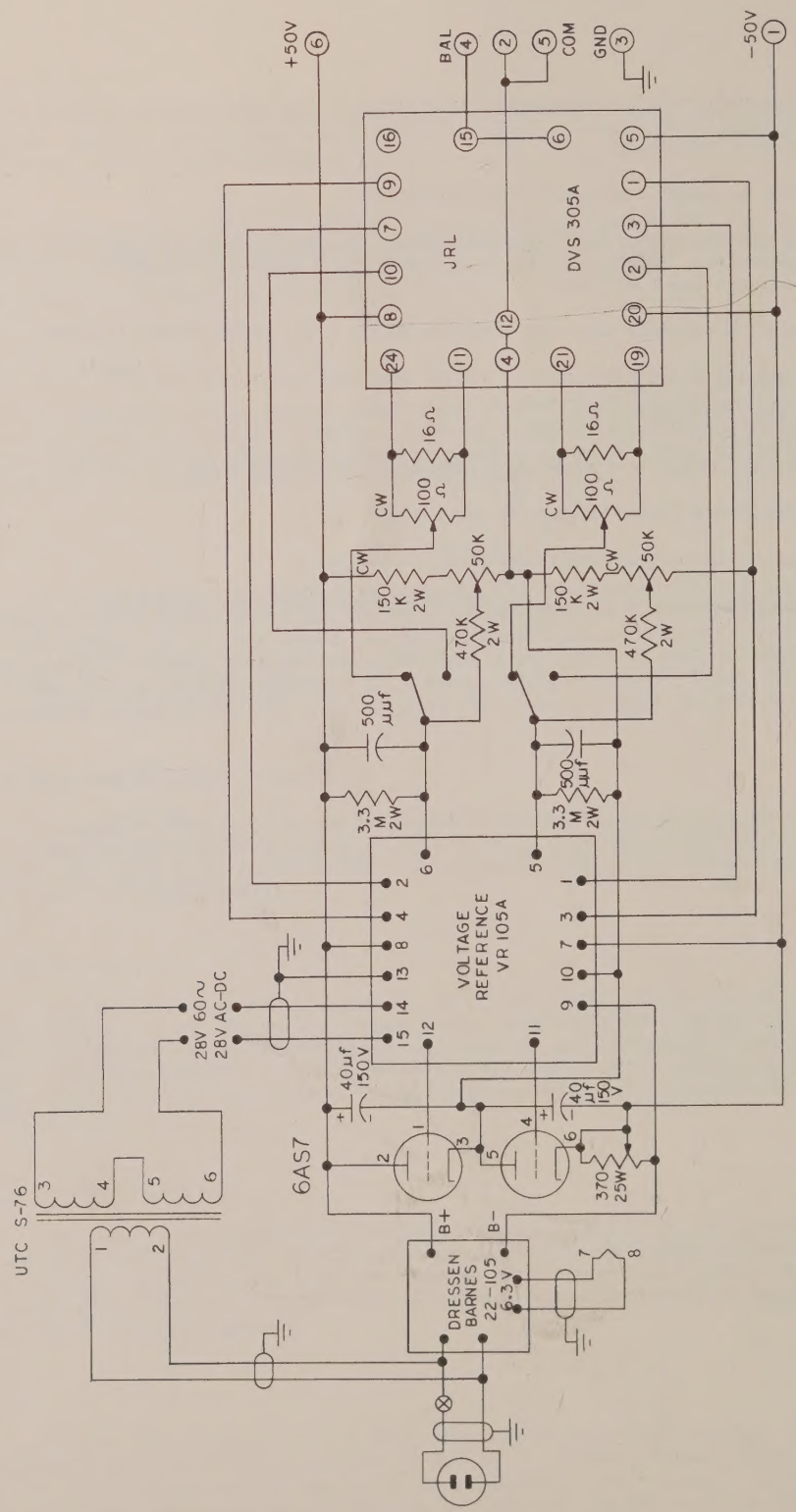


Figure 2. PVS-105A, Schematic Diagram

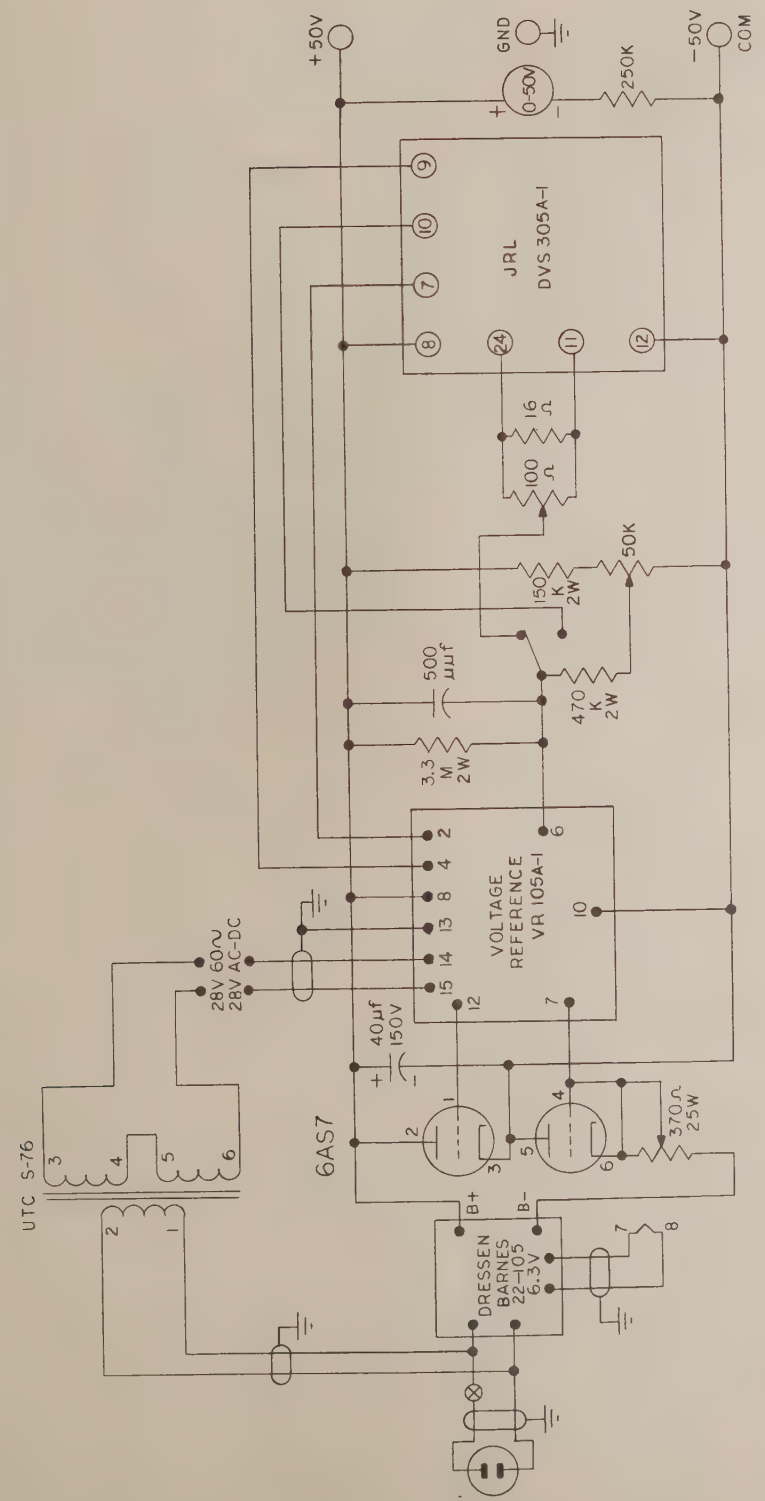


Figure 3. PVS-105A-1, Schematic Diagram

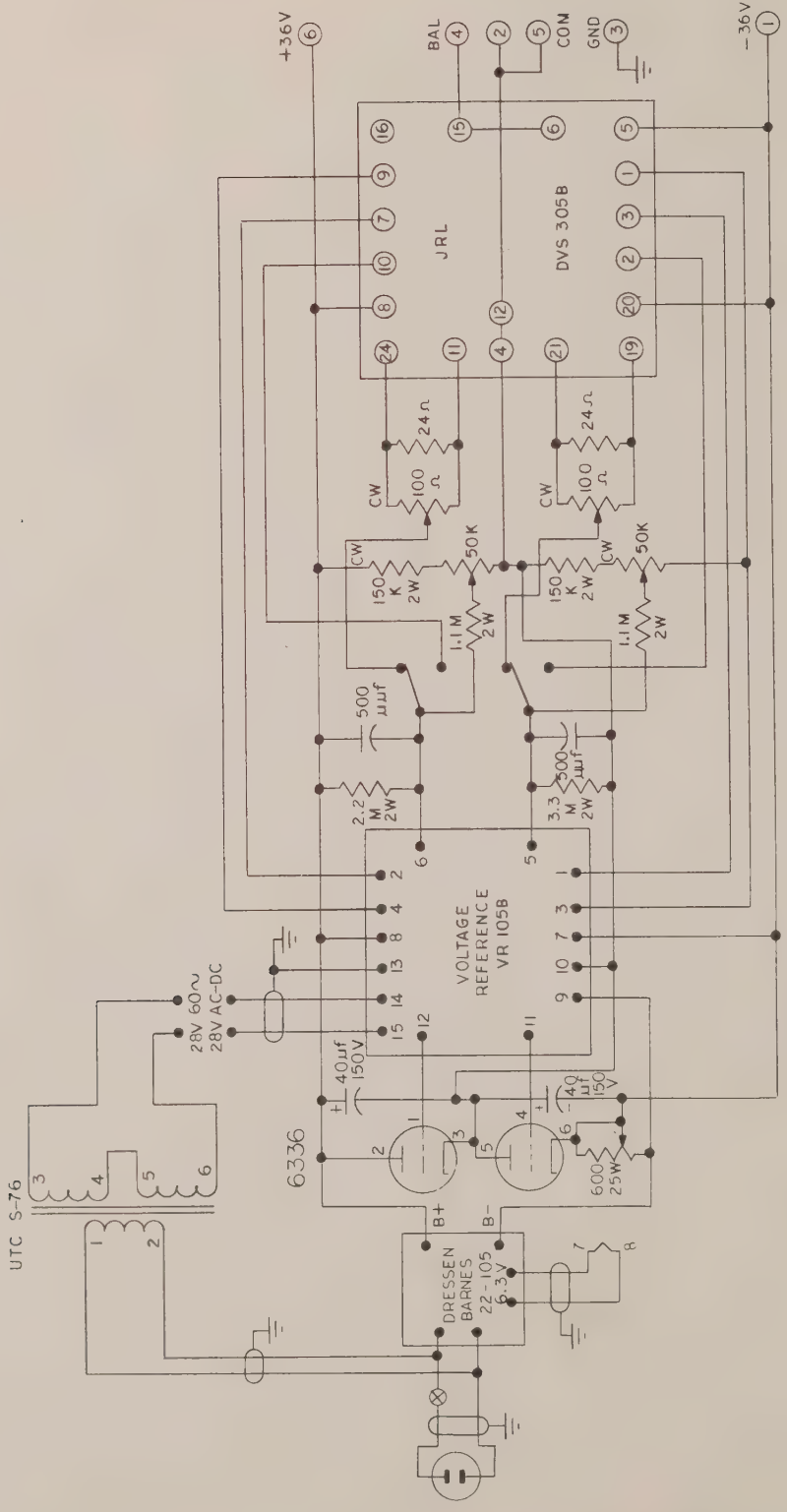


Figure 4. PVS-105B, Schematic Diagram

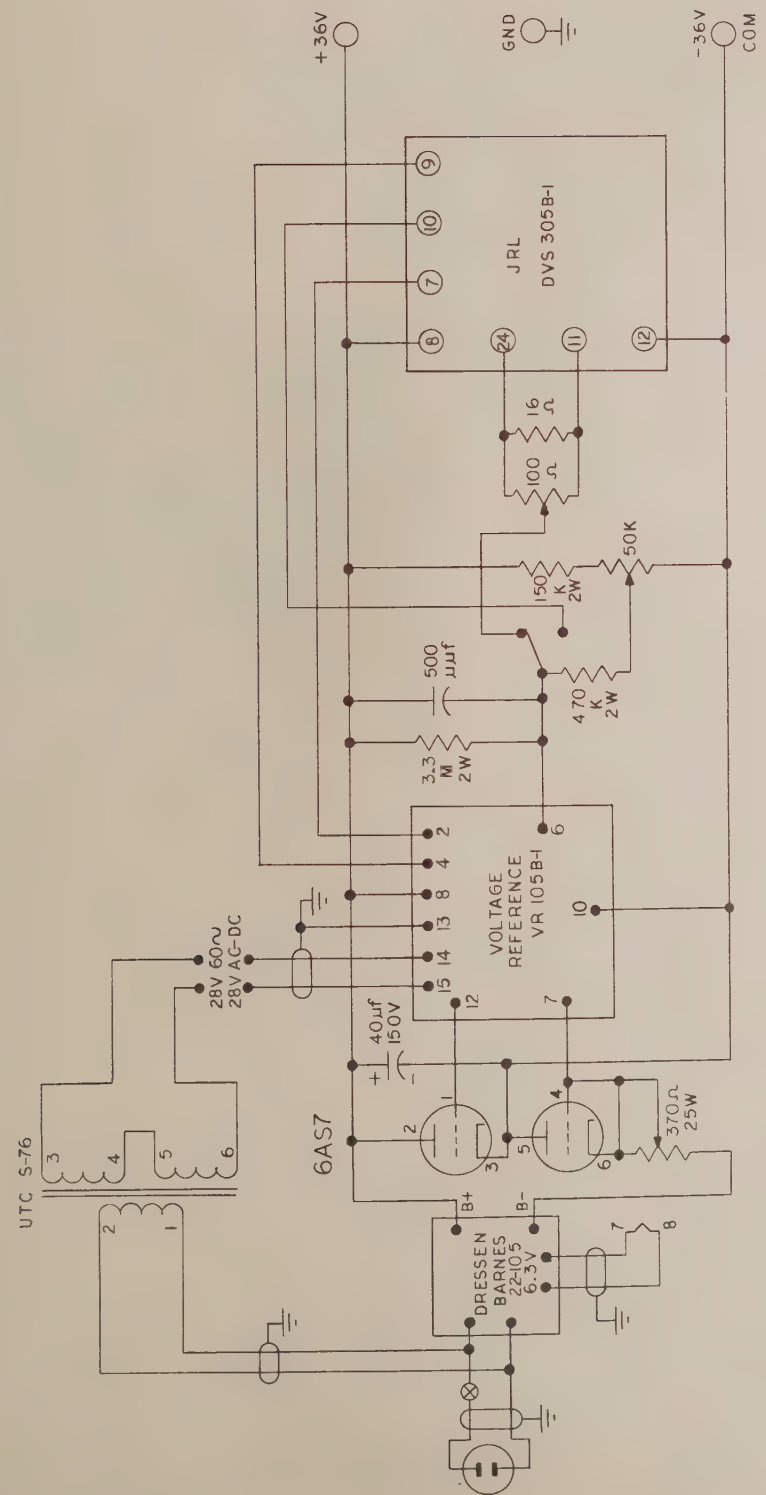


Figure 5. PVS-105B-1, Schematic Diagram

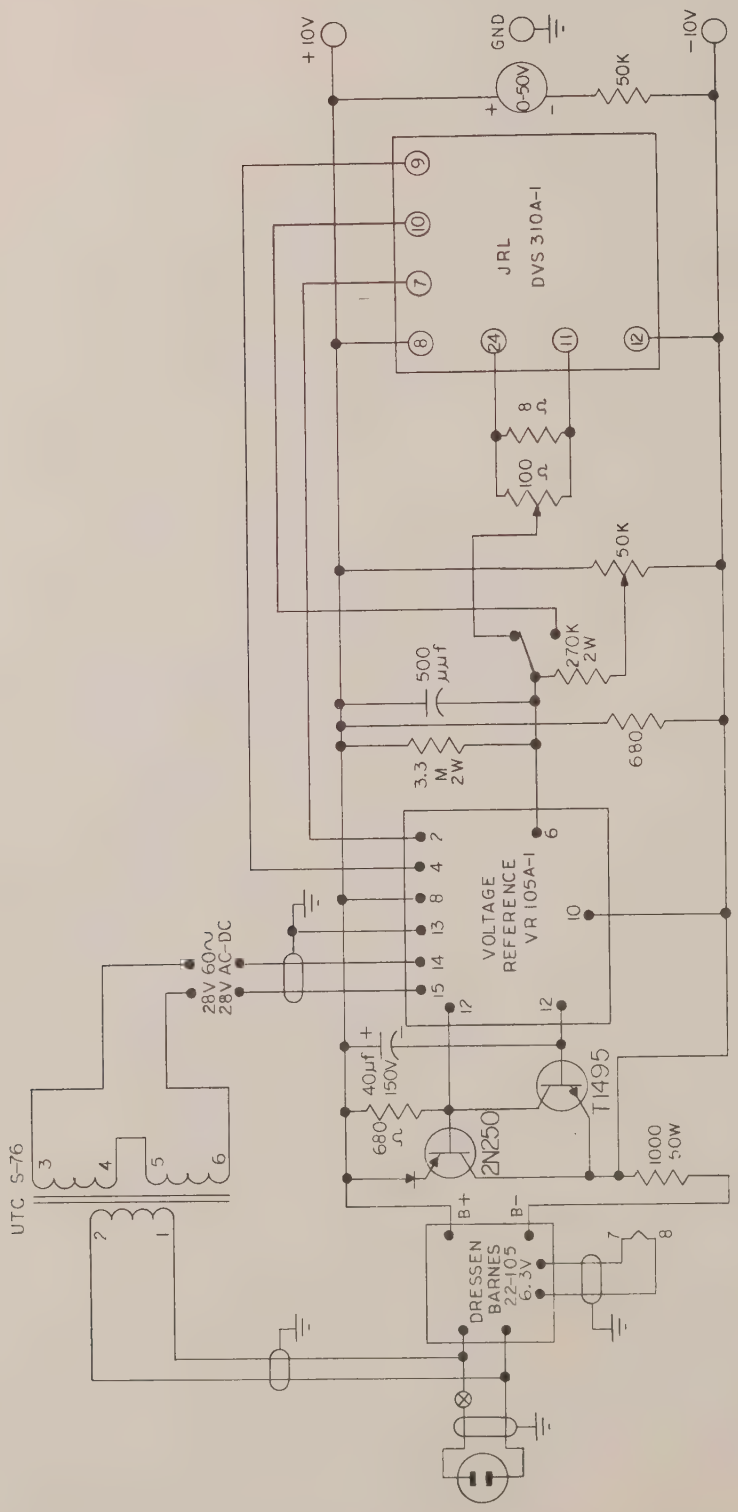


Figure 6. PVS-110A, Schematic Diagram

Circle 5-2727

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WARRANTY

JULIE RESEARCH LABORATORIES, INC. guarantees to the original purchaser that all instruments shall be free from defects in material and workmanship for a period of one (1) year after date of initial shipment. Our liability is limited to repairing and replacing any defective part with the exception of vacuum tubes, panel lamps, fuses, choppers, and batteries. The warranty lapses, if upon our investigation, we judge that the instrument has been abused in any way.